

## **AMENDMENTS TO THE CLAIMS**

This listing of claims will replace all prior versions, and listings, of claims in the application:

### **Listing of Claims:**

- 1           1.       (Currently amended) A method for reducing data burst overhead  
2       in an Ethernet passive optical network which includes a central node and at least  
3       one remote node, wherein downstream data from the central node is broadcast to  
4       the remote nodes, and wherein upstream data from each remote node is  
5       transmitted to the central node in a unicast manner, the method comprising:  
6           transmitting grant messages to a number of remote nodes, wherein a grant  
7       message for a specified remote node assigns a start time and a duration of a  
8       transmission timeslot in which the specified remote node may transmit a upstream  
9       data burst; and  
10       receiving a number of upstream data bursts, wherein the time gap between  
11       two consecutive upstream data bursts is less than the summation of a default laser  
12       turn-on time, a default laser turn-off time, an automatic gain control (AGC)  
13       period, and a clock and data recovery (CDR) period;  
14       wherein a preceding upstream data burst's laser turn-off period overlaps  
15       with a subsequent data burst's laser turn-on period;  
16       wherein the non-overlapping portion of the preceding data burst's laser  
17       turn-off period is equal to or greater than twice the allowed maximum jitter of the  
18       round-trip time between the central node and a remote node; and  
19       wherein the non-overlapping portion of the subsequent data burst's laser  
20       turn-on period is equal to or greater than twice the allowed maximum jitter of the  
21       round-trip time between the central node and a remote node.

1           2.     (Cancelled)

1           3.     (Cancelled)

1           4.     (Currently amended) The method of claim ~~2~~1, wherein a grant  
2 message specifies a transmission timeslot start time that is earlier than the ending  
3 time of an immediately preceding transmission timeslot.

1           5.     (Original) The method of claim 1, wherein receiving a number of  
2 upstream data bursts involves receiving a number of consecutive data bursts from  
3 a remote node, wherein the remote node is allowed to transmit the number of  
4 consecutive data bursts without turning off and turning on its laser between two  
5 consecutive data bursts.

1           6.     (Original) The method of claim 5, further comprising detecting  
2 the time gap between two consecutive transmission timeslots assigned to the  
3 remote node; and  
4           if the time gap is less than a pre-defined value, allowing the remote node  
5 to transmit upstream data during the time gap without turning off and turning on  
6 its laser.

1           7.     (Original) The method of claim 1, wherein if one or more remote  
2 nodes are virtual remote nodes located in a common physical remote node, and if  
3 these virtual remote nodes transmit upstream data through a common laser  
4 belonging to the common physical remote node, the method further comprises:  
5           allowing the common laser to keep transmitting upstream data without  
6 being turned off between consecutive transmission timeslots assigned to one or  
7 more virtual remote nodes located in the common physical remote node.

1           8.       (Original) The method of claim 7, wherein a grant message  
2 contains a  
3 laser-turn-on flag and a laser-turn-off flag;  
4           wherein if a grant message's laser-turn-on flag is true, the corresponding  
5 remote node turns on its laser at the start time of its assigned transmission  
6 timeslot and transmits an AGC bit sequence and a CDR bit sequence before  
7 transmitting upstream data;  
8           wherein if a grant message's laser-turn-on flag is false, the corresponding  
9 remote node immediately starts transmitting upstream data at the start time of its  
10 assigned transmission timeslot without transmitting an AGC bit sequence and a  
11 CDR bit sequence;  
12           wherein if a grant message's laser-turn-off flag is true, the corresponding  
13 remote node turns off its laser after transmitting upstream data; and  
14           wherein if a grant message's laser-turn-off flag is false, the corresponding  
15 remote node continues transmitting data until the end of its assigned transmission  
16 timeslot without turning off its laser.

1           9.       (Original) The method of claim 7, wherein if one or more remote  
2 nodes are virtual remote nodes located in a common physical remote node, and if  
3 these virtual remote nodes transmit upstream data through a common laser  
4 belonging to the common physical remote node, the method further comprises  
5 allowing the common laser to keep transmitting the upstream data bursts without  
6 being turned off between consecutive transmission timeslots assigned to one or  
7 more virtual remote nodes located in the common physical remote node.

1           10.      (Original) The method of claim 1, further comprising receiving an  
2 actual  
3 laser turn-on time and an actual laser turn-off time from a remote node;

4            wherein the actual laser turn-on and turn-off times specify the amount of  
5            time required by the remote node to turn on and turn off its laser, respectively.

1            11.     (Original) The method of claim 10, wherein the actual laser turn-  
2            on and turn-off times are transmitted with a registration message from the remote  
3            node when the central node initially registers the remote node.

1            12.     (Original) The method of claim 10, wherein a grant message  
2            assigns a start time and a duration of a transmission timeslot based on the actual  
3            laser turn-on and turn-off times of the remote node to which the grant message is  
4            destined.

1            13.     (Currently amended) An apparatus for reducing data burst  
2            overhead in an Ethernet passive optical network, comprising:  
3            at least one remote node; and  
4            a central node configured to,  
5                      transmit grant messages to a number of remote nodes, wherein a  
6            grant message for a specified remote node assigns a start time and a  
7            duration of a transmission timeslot in which the specified remote node  
8            may transmit a upstream data burst; and  
9                      receive a number of upstream data bursts, wherein the time gap  
10           between two consecutive upstream data bursts is less than the summation  
11           of a default laser turn-on time, a default laser turn-off time, an AGC  
12           period, and a CDR period;  
13           wherein the central node is configured to broadcast downstream data to the  
14           remote nodes; ~~and~~  
15           wherein each remote node is configured to transmit upstream data to the  
16           central node in a unicast manner;

17 wherein a preceding upstream data burst's laser turn-off period overlaps  
18 with a subsequent data burst's laser turn-on period;  
19 wherein the non-overlapping portion of the preceding data burst's laser  
20 turn-off period is equal to or greater than twice the allowed maximum jitter of the  
21 round-trip time between the central node and a remote node; and  
22 wherein the non-overlapping portion of the subsequent data burst's laser  
23 turn-on period is equal to or greater than twice the allowed maximum jitter  
24 of the round-trip time between the central node and a remote node..

1 14. (Cancelled)

1 15. (Cancelled)

1 16. (Currently amended) The apparatus of claim ~~14~~13, wherein a  
2 grant message specifies a transmission timeslot start time that is earlier than the  
3 ending time of an immediately preceding transmission timeslot.

1 17. (Original) The apparatus of claim 13, wherein a remote node is  
2 configured to transmit a number of consecutive data bursts without turning off  
3 and turning on its laser between two consecutive data bursts.

1 18. (Original) The apparatus of claim 17, wherein the remote node is  
2 further configured to detect the time gap between two consecutive transmission  
3 timeslots assigned to the remote node; and  
4 if the time gap is less than a pre-defined value, allow the remote node to  
5 transmit upstream data during the time gap without turning off and turning on its  
6 laser.

1           19.     (Original) The apparatus of claim 13, wherein if one or more  
2 remote nodes are virtual remote nodes located in a common physical remote  
3 node, and if these virtual remote nodes transmit upstream data through a  
4 common laser belonging to the common physical remote node, the common  
5 physical remote node is configured to:  
6           allow the common laser to keep transmitting upstream data without being  
7 turned off between consecutive transmission timeslots assigned to one or more  
8 virtual remote nodes located in the common physical remote node.

1           20.     (Original) The apparatus of claim 19, wherein a grant message  
2 contains a  
3 laser-turn-on flag and a laser-turn-off flag;  
4           wherein if a grant message's laser-turn-on flag is true, the corresponding  
5 remote node is configured to turn on its laser at the start time of its assigned  
6 transmission timeslot and transmits an AGC bit sequence and a CDR bit  
7 sequence before transmitting upstream data;  
8           wherein if a grant message's laser-turn-on flag is false, the corresponding  
9 remote node is configured to start immediately transmitting upstream data at the  
10 start time of its assigned transmission timeslot without transmitting an AGC bit  
11 sequence and a CDR bit sequence;  
12           wherein if a grant message's laser-turn-off flag is true, the corresponding  
13 remote node is configured to turn off its laser after transmitting upstream data;  
14 and  
15           wherein if a grant message's laser-turn-off flag is false, the corresponding  
16 remote node is configured to continue transmitting data until the end of its  
17 assigned transmission timeslot without turning off its laser.

1           21.     (Original) The apparatus of claim 19, wherein if one or more  
2 remote nodes are virtual remote nodes located in a common physical remote  
3 node, and if these virtual remote nodes transmit upstream data through a  
4 common laser belonging to the common physical remote node, the physical  
5 remote node is further configured to allow the common laser to keep transmitting  
6 the upstream data bursts without being turned off between consecutive  
7 transmission timeslots assigned to one or more virtual remote nodes located in  
8 the common physical remote node.

1           22.     (Original) The apparatus of claim 13, wherein the central node is  
2 further configured to receive an actual laser turn-on time and an actual laser turn-  
3 off time from a remote node; and  
4           wherein the actual laser turn-on and turn-off times specify the amount of  
5 time required by the remote node to turn on and turn off its laser, respectively.

1           23.     (Original) The apparatus of claim 22, wherein the actual laser  
2 turn-on and turn-off times are transmitted with a registration message from the  
3 remote node when the central node initially registers the remote node.

1           24.     (Original) The apparatus of claim 22, wherein a grant message  
2 assigns a start time and a duration of a transmission timeslot based on the actual  
3 laser turn-on and turn-off times of the remote node to which the grant message is  
4 destined.

1           25.     (Currently amended) A computer-readable storage ~~medium-device~~  
2 storing instructions that when executed by a computer cause the computer to  
3 perform a method for reducing data burst overhead in an Ethernet passive optical  
4 network which includes a central node and at least one remote node, wherein

5 downstream data from the central node is broadcast to the remote nodes, and  
6 wherein upstream data from each remote node is transmitted to the central node  
7 in a unicast manner, the method comprising:  
8 transmitting grant messages to a number of remote nodes, wherein a grant  
9 message for a specified remote node assigns a start time and a duration of a  
10 transmission timeslot in which the specified remote node may transmit a upstream  
11 data burst; and  
12 receiving a number of upstream data bursts, wherein the time gap between  
13 two consecutive upstream data bursts is less than the summation of a default laser  
14 turn-on time, a default laser turn-off time, an automatic gain control (AGC)  
15 period, and a clock and data recovery (CDR) period;  
16 wherein a preceding upstream data burst's laser turn-off period overlaps  
17 with a subsequent data burst's laser turn-on period;  
18 wherein the non-overlapping portion of the preceding data burst's laser  
19 turn-off period is equal to or greater than twice the allowed maximum jitter of the  
20 round-trip time between the central node and a remote node; and  
21 wherein the non-overlapping portion of the subsequent data burst's laser  
22 turn-on period is equal to or greater than twice the allowed maximum jitter of the  
23 round-trip time between the central node and a remote node.

1 26. (Cancelled)

1 27. (Cancelled)

1 28. (Currently amended) The computer-readable storage ~~medium~~  
2 device of claim ~~26~~25, wherein a grant message specifies a transmission timeslot  
3 start time that is earlier than the ending time of an immediately preceding  
4 transmission timeslot.



1           29.     (Currently amended) The computer-readable storage ~~medium~~  
2     device of claim 25, wherein receiving a number of upstream data bursts involves  
3     receiving a number of consecutive data bursts from a remote node, wherein the  
4     remote node is allowed to transmit the number of consecutive data bursts without  
5     turning off and turning on its laser between two consecutive data bursts.

1           30.     (Currently amended) The computer-readable storage ~~medium~~  
2     device of claim 29, wherein the method further comprises detecting the time gap  
3     between two consecutive transmission timeslots assigned to the remote node; and  
4           if the time gap is less than a pre-defined value, allowing the remote node  
5     to transmit upstream data during the time gap without turning off and turning on  
6     its laser.

1           31.     (Currently amended) The computer-readable storage ~~medium~~  
2     device of claim 25, wherein if one or more remote nodes are virtual remote nodes  
3     located in a common physical remote node, and if these virtual remote nodes  
4     transmit upstream data through a common laser belonging to the common  
5     physical remote node, the method further comprises:  
6           allowing the common laser to keep transmitting upstream data without  
7     being turned off between consecutive transmission timeslots assigned to one or  
8     more virtual remote nodes located in the common physical remote node.

1           32.     (Currently amended) The computer-readable storage ~~medium~~  
2     device of claim 31, wherein a grant message contains a laser-turn-on flag and a  
3     laser-turn-off flag;  
4           wherein if a grant message's laser-turn-on flag is true, the corresponding  
5     remote node turns on its laser at the start time of its assigned transmission

6 timeslot and transmits an AGC bit sequence and a CDR bit sequence before  
7 transmitting upstream data;  
8 wherein if a grant message's laser-turn-on flag is false, the corresponding  
9 remote node immediately starts transmitting upstream data at the start time of its  
10 assigned transmission timeslot without transmitting an AGC bit sequence and a  
11 CDR bit sequence;  
12 wherein if a grant message's laser-turn-off flag is true, the corresponding  
13 remote node turns off its laser after transmitting upstream data; and  
14 wherein if a grant message's laser-turn-off flag is false, the corresponding  
15 remote node continues transmitting data until the end of its assigned transmission  
16 timeslot without turning off its laser.

1 33. (Currently amended) The computer-readable storage ~~medium~~  
2 device of claim 31, wherein if one or more remote nodes are virtual remote nodes  
3 located in a common physical remote node, and if these virtual remote nodes  
4 transmit upstream data through a common laser belonging to the common  
5 physical remote node, the method further comprises allowing the common laser  
6 to keep transmitting the upstream data bursts without being turned off between  
7 consecutive transmission timeslots assigned to one or more virtual remote nodes  
8 located in the common physical remote node.

1 34. (Currently amended) The computer-readable storage ~~medium~~  
2 device of claim 25, wherein the method further comprises receiving an actual  
3 laser turn-on time and an actual laser turn-off time from a remote node; and  
4 wherein the actual laser turn-on and turn-off times specify the amount of  
5 time required by the remote node to turn on and turn off its laser, respectively.

1           35.   (Currently amended) The computer-readable storage ~~medium~~  
2   device of claim 34, wherein the actual laser turn-on and turn-off times are  
3   transmitted with a registration message from the remote node when the central  
4   node initially registers the remote node.

1           36.   (Currently amended) The computer-readable storage ~~medium~~  
2   device of claim 34, wherein a grant message assigns a start time and a duration of  
3   a transmission timeslot based on the actual laser turn-on and turn-off times of the  
4   remote node to which the grant message is destined.